

## NOTES BY THE EDITOR.

## CURRENTS OF LAKE ONTARIO.

The last number of the "Transactions of the Canadian Institute" gives an account of the work done by the Provincial Board of Health and the Toronto City Council with reference to the currents of Lake Ontario in order to ascertain with what degree of safety the sewage may be deposited in the Lake. "The apparatus used for ascertaining the direction and velocity of the currents was a float or drag made of two cross brackets of wood covered with linen, a rope of from 20 to 60 feet attached, to suit the required depth, and a tin float surmounted by a flag and numbered. The floats were made of different sizes, the arm pieces of the brackets varying from 2½ to 5 feet in length, and the canvas from 27 to 54 inches in breadth. These drags required to be nicely adjusted by hanging weights to them to keep them in position, and it sometimes occurred that we would lose a float and all by weighting it a little too heavily."

By means of such floats as these the movements of the water at depths of from 15 to 80 feet were determined during July, August, September, October, 1891, in that portion of Lake Ontario near Toronto; frequent observations were made of the position of the float and flag in the course of its drift hour by hour during the daytime, so that the rate and direction could be determined at every point of its course. Observations were made in high winds as well as in light winds. The general direction of the currents was parallel to the coast line, that is, either from northeast when northeast, east, and southeast winds prevailed or from southwest when south, southwest, and west winds prevailed. On seven occasions when the wind was from the north and northwest the resulting currents were two from the southwest, three from the northeast, and two from the northwest, so that north and northwest winds were not attended by any prevailing type of current. Similarly a southwest wind would

produce a current from the southwest in regions to the south of the island, while a current to the southeast prevailed west of the island. The undercurrent was contrary to the wind more frequently in Humber Bay than to the south of the island. Close inshore the current was sometimes opposite to that farther out. On July 17 the wind was fresh from the east; an empty tin can was driven before the wind on the tops of the waves, but a float 4 feet below the surface and another 30 feet below the surface both went dead against the wind.

The additional experience of fishermen shows that at Niagara, on the south shore of the lake opposite to Toronto, when an easterly wind prevails there is a strong undercurrent from the west, and in general when the surface waters driven by the wind are piled against the beach the head of water thus maintained forces a portion of the lower water back as an undercurrent. This undercurrent from the west, which is so strongly marked at the southwestern shore of Lake Ontario, was found to prevail for a considerable distance toward the middle of the lake. The current, directly due to the inflow of the Niagara River, has a temperature originally of 69° or 70°, while at a depth of 400 feet the lake water has a temperature of 39.5°. It is this latter cold, deep water that cools the surface flow before it reaches the intake of the water-works at Toronto.

The investigation satisfactorily showed that the lake currents are caused by the wind, that they change direction as the wind changes, with, of course, a slight lagging behind. The prevailing winds are from the west on the average of the whole year, but they happened to be from the east during the period of this investigation. It was concluded that if the outlet of the sewage pipes was located a mile from the shore of the island, then the water received at the intake, which is less than half a mile from the shore and 70 feet below the surface, would be entirely free from danger of contamination.

## METEOROLOGICAL TABLES.

Meteorological record of voluntary and other co-operating observers, September, 1893.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<i>Alabama.</i>	o	o	o	<i>Ins.</i>	<i>Arizona.</i>	o	o	o	<i>Ins.</i>
Alco	94	57	76.6	...	Antelope Valley†	98	55	78.5	0.03
Bermuda*†	91	58	74.9	3.57	Henson*†	94	54	70.3	0.12
Birmingham†	94	58	78.0	5.67	Bisbee†	94	54	70.3	1.71
Brewton†	100	55	76.8	3.45	Buckeye†	104	50	79.0	0.10
Camden*†	92	60	75.8	3.00	Calabasas†	98	46	71.3	1.76
Carrollton*†	87	54	72.5	4.44	Casa Grande*†	105	65	87.1	0.00
Citronelle†	91	65	77.6	6.63	Crittenden†	100	43	73.2	0.97
Claiborne Landing†	...	...	...	3.90	Dragon Summit*†	98	60	80.4	1.13
Clanton†	91	52	73.4	2.66	Dudleyville†	98	51	77.1	0.33
Cordova†	...	...	...	4.14	Earleys Camp	91	56	77.2	0.00
Decatur†	92	42	69.8	4.61	Flagstaff*†	78	33	58.9	0.40
Demopolis†	...	...	...	3.84	Florence†	101	60	80.8	1.47
Elba*†	93	67	74.8	5.03	Fort Apache	89	39	64.6	2.65
Eufaula†	98	60	79.8	5.09	Fort Bowie†	93	49	73.6	1.06
Eufaula c†	...	...	...	4.41	Fort Grant	95	48	72.2	3.87
Evergreen†	96	58	76.4	3.37	Fort Huachuca	92	48	70.0	2.62
Florence†	...	...	...	3.78	Fort Mohave	100	54	81.4	0.00
Florence b†	93	44	70.8	4.88	Gila Bend b*†	98	60	77.2	0.14
Fort Deposit†	93	58	76.9	4.01	Holbrook†	90	40	65.8	0.95
Gadsden†	...	...	...	3.38	Maricopa*†	108	70	87.8	2.08
Greensboro†	91	55	73.7	3.12	Mount Huachuca†	89	50	71.0	2.33
Healing Springs†	95	50	77.3	5.53	Natural Bridge†	...	...	...	2.03
Highland Home†	92	58	76.0	3.95	Oracle†	89	52	72.2	...
Livingston†	96	52	74.6	6.61	Oro	...	...	...	1.26
Lynn†	...	...	...	4.77	Pantano*†	97	62	78.9	0.00
Lynn b*†	94	60	74.8	2.67	Payson*†	86	40	64.4	3.41
Maple Grove†	94	40	74.9	2.26	Peoria†	98	56	79.4	0.35
Marion†	92	56	75.0	4.03	Red Rock*†	105	65	86.2	0.40
Mount Willing†	93	60	77.4	4.35	Reymert†	96	55	76.6	1.32
Newbern†	90	44	74.3	2.00	Rye†	...	...	...	3.73
Newburg†	97	44	71.6	5.14	St. Helena R'h*†	92	54	73.4	1.03
Newton†	94	57	74.8	6.27	San Carlos	102	46	75.4	2.56
Opelika†	92	58	75.7	3.63	San Simon*†	103	50	79.5	0.92
Oxanna*†	88	50	71.4	4.13	Show Low	...	...	...	3.25
Pine Apple†	94	52	75.2	4.71	Signal†	99	53	77.4	1.15
Pushmataha†	90	58	75.2	5.04	Teviston	...	...	...	1.20
Rock Mills†	90	53	75.0	1.19	Texas Hill*†	105	66	85.3	0.00
Selma†	...	...	...	3.05	Tucson†	99	55	79.4	0.05
Starlington	91	59	75.0	5.30	Tucson b*†	98	60	81.2	0.40
Sturdevant†	...	...	...	4.81	Walnut Ranch*†	88	54	69.2	2.82
Talladega†	...	...	...	2.48	Whipple Barracks	88	34	59.9	0.57
Talladega b	90	62	79.1	...	Wilcox†	...	...	...	2.75
Tallasse Falls†	...	...	...	3.89	Willcox*†	92	58	74.4	0.93
Thomasville†	94	56	75.5	6.80	Yuma*†	100	69	83.4	0.30
Tuscaloosa†	...	...	...	3.75	<i>Arkansas.</i>	...	...	...	...
Tuscumbia*†	93	42	71.0	4.02	Arkadelphia†	...	...	...	0.71
Tusculum†	93	48	72.6	4.71	Arkansas City†	102	...	...	3.25
Union Springs*†	92	56	76.6	2.75	Ashdown†	102	46	73.4	2.36
Union Springs b†	94	55	75.2	2.84	Bee Branch†	104	50	75.4	6.87
Uniontown†	92	58	77.1	2.93	Brinkley†	92	45	72.4	3.70
Valley Head†	92	42	69.4	2.89	Camden†	...	...	...	2.64
Warrior†	...	...	...	4.01	Conway*†	95	50	73.2	4.25
Wilsonville†	...	...	...	2.51	Corning†	94	37	70.5	5.13

Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<i>Arkansas—Cont'd.</i>	o	o	o	<i>Ins.</i>	<i>California—Cont'd.</i>	o	o	o	<i>Ins.</i>
Dallas*†	93	46	73.9	3.86	Byron*†	92	50	65.0	0.00
Dardanelle†	...	...	...	6.52	Caliente*†	100	50	68.3	0.00
Fayetteville†	100	39	73.2	3.08	Calistoga*†	88	46	64.3	0.85
Fulton†	94	45	74.8	6.19	Campo Seco	...	...	...	0.57
Gaines Landing†	...	...	...	3.50	Capitola*†	75	48	62.5	0.00
Hamburg.	...	...	...	2.40	Castroville*†	74	45	60.3	0.13
Helena*†	93	48	73.2	0.91	Centerville*†	86	...	...	0.14
Helena b†	94	48	72.6	7.18	Chico*†	98	45	64.7	0.67
Hot Springs	103	41	76.0	6.10	Chino*†	85	50	65.3	0.00
Keesees Ferry†	102	36	72.6	2.05	Cisco*†	75	38	47.9	0.00
Kirby†	99	43	74.5	4.03	Citrus*†	100	...	...	66.0
Lonoke*†	94	47	75.2	1.47	Claremont†	94	44	64.6	0.00
Malvern†	96	46	74.0	2.12	Cloverdale*†	84	45	67.2	2.07
Marcella†	...	...	...	8.27	Colegrove	...	...	...	0.00
Marshall†	94	44	71.4	7.00	Colfax*†	97	46	62.5	0.85
Mount Nebo†	94	44	71.4	5.92	Colton*†	98	50	70.3	0.00
New Gascony*†	97	52	73.4	3.11	Colusa†	91	43	65.8	0.04
Newport a†	96	43	73.8	0.57	Corning*†	95	48	68.9	0.22
Newport c†	96	42	71.6	6.14	Crescent City	...	...	...	5.22
Oacela†	95	44	71.8	6.67	Crescent City L. H.	94	...	...	5.42
Ozark†	101	46	77.6	6.09	Groffton*†	94	52	70.5	0.76
Pine Bluff†	96	48	75.0	6.17	Idaville a*†	88	56	67.3	0.00
Prescott†	95	50	76.4	2.10	Idaville b	93	47	69.0	1.00
Rison†	101	48	76.7	2.96	Delano*†	95	60	72.8	0.00
Russellville†	101	44	74.6	7.08	Delta*†	95	40	65.7	2.85
Stuttgart†	93	45	72.6	3.66	Dinuba*†	100	57	73.1	1.00
Texasana†	100	52	77.5	1.93	Downey*†	90	56	69.8	0.00
Washington b†	99	49	70.4	2.45	Dry Creek*†	...	...	...	62.7
Wiggs	...	...	...	1.25	Duarte	97	51	69.4	0.04
Winslow*†	83	46	71.2	5.01	Dunnigan*†	90	54	68.5	0.00
<i>California.</i>	...	...	...	...	Dunsmuir*†	95	40	59.0	3.27
Anaheim*†	86	55	67.1	0.00	East Brother L. H.	...	...	...	0.00
Anderson*†	90	44	65.0	2.22	Edgewood*†	87	31	54.5	1.51
Antioch*†	90	52	67.0	0.02	Edmonton*†	83	34	52.0	1.79
Aptos*†	75	44	60.5	0.02	Eldorado*†	92	49	65.5	1.14
Arata†	68	38	55.2	3.01	Elmira*†	94	50	66.6	0.16
Asphalto*†	98	52	70.9	0.00	El Verano*†	85	45	63.4	0.92
Athlone*†	100	50	69.0	0.00	Emigrant Gap*†	79	30	53.4	1.20
Auburn*†	90	53	68.1	0.70	Esparto*†	97	52	72.0	0.02
Bakersfield a*†	100	59	72.2	0.00	Evergreen	...	...	...	0.02
Bakersfield b†	97	45	70.0	0.00	Exeter*†	97	62	71.3	0.00
Ballast Point L. H.	...	...	...	0.00	Fall Brook*†	90	52	64.6	0.06
Beaumont*†	93	46	68.8	0.00	Farmington*†	88	46	71.6	0.46
Belmont*†	86	55	65.5	0.00	Felton*†	90	40	63.7	0.40
Berendo*†	98	58	72.1	0.00	Fernando*†	94	44	64.7	0.00
Berkeley	74	48	60.2	0.38	Florence*†	81	57	69.3	0.00
Bishop Creek*†	96	48	71.8	0.19	Folsom City a*†	90	52	69.4	0.51
Boca*†	88	28	52.5	0.55	Folsom City b*†	90	53	67.7	0.43
Borden*†	97	54	70.1	0.00	French Corral	87	44	65.8	1.23
Boulder Creek*†	70	38	50.3	0.57	Fresno*†	95	54	69.9	0.00
Brentwood*†	88	49	64.4	0.00	Fruto*†	90	50	64.3	0.22
Brighton*†	95	57	70.8	0.20	Galt*†	89	50	67.0	0.16
					Georgetown†	86	40	61.6	2.06
					Gilroy*†	85	52	63.1	0.06